

REMARKS

The claimed invention

The present invention is a musical instrument preamplifier system comprising a filtering means for splitting an input signal into two or more separate frequency bands, two or more non-linear circuits, and a summing network.

Applicant has rewritten claims 2, 9, 15, 19 in independent form as suggested by the Examiner. Applicant has also made a minor amendment to claims 2, 13 and 15 to correct a typographical error. Applicant has cancelled claims 1, 4, 6, 8, 10-12, 14, 17, 18, but has substantially incorporated the subject matter of these claims into new claims 21-39 along with amendments to more particularly point out and distinctly claim the subject matter of the invention. Applicant has added two new independent claims 40 and 41. Applicant respectfully asserts that no new subject matter is added by these amendments.

Attached to this Response please find a MARKED-UP VERSION OF AMENDMENT TO SHOW CHANGES MADE and a COMPLETE LIST OF CLAIMS AS AMENDED.

Information Disclosure Statement

Applicant has submitted a Supplemental Information Disclosure Statement and appropriate fee with this Response.

Rejections under 35 USC 102

The Examiner rejects claims 1, 4, 6, 8, 10-12, 14, 17 and 18 under 35 USC 102(e) as being anticipated by Kuroki. Applicant notes that although claims 8 and 17 were listed as rejected, they do not appear to have been specifically addressed in paragraph 3 of the Office Action. Applicant has cancelled claims 1, 4, 6, 8, 10-12, 14, 17, 18, but has substantially incorporated the subject matter of these claims into new claims 21-39 along with amendments to more particularly point out and distinctly claim the subject matter of the invention. Applicant has amended independent claims 21 and 33 to recite the limitation of a *substantially equi-phase* response and has removed the phrase "the input signal component" to more particularly point out and distinctly claim the subject matter of the invention. For the reasons detailed below, Applicant asserts that new claims 21-39 are in condition for allowance.

present invention. Finally, the reference entitled Quadrafuzz discloses band splitting but does not teach producing an equi-phase response in the output bands.

Claims 22-32 depend from claim 21 and claims 34-39 depend from claim 33. Based on the above discussion, Applicant respectfully asserts that new claims 21-39 are in condition for allowance.

Allowable Subject Matter

Applicant thanks the Examiner for the indication of allowable subject matter.

The Examiner has allowed claim 13. Applicant has made one change to correct a typographical error. The entry $[2^{N-1}]$ has been corrected to read $-- 2^N - 1 --$. This typographical error has also been corrected in claims 2 and 15.

The Examiner objects to claims 2, 3, 5, 7, 9 as being dependent on a rejected base claim 1, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant has rewritten claims 2 and 9 in independent form as suggested by the Examiner. Claims 3, 5, and 7 depend from claim 2. Applicant respectfully asserts that these claims are now in condition for allowance.

The Examiner objects to claims 15, 16, 19 and 20 as being dependent on a rejected base claim 14, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant has rewritten claims 15 and 19 in independent form as suggested by the Examiner. Claim 16 depends from 15 and claim 20 depends from 19. Applicant respectfully asserts that these claims are now in condition for allowance.

New Claims

As discussed above, Applicant has added new claims 21-39 which correspond to the cancelled claims 1, 4, 6, 8, 10-12, 14, 17, 18, with amendments made to more particularly point out and distinctly claim the subject matter of the invention.

Applicant has also added new independent claims 40 and 41. Claim 40 recites a filtering means with a first filter network including a plurality of band splitter filters to split a signal on the input into a plurality of substantially equi-phase frequency bands, and a plurality of non-linear circuits to distort respective output frequency bands.

Claim 41 recites a filtering means for splitting an input signal into a plurality of substantially equi-phase frequency band outputs, and a plurality of non-linear circuits to distort respective output frequency bands. The filtering means includes a cascade first filter network and one or more subsequent filter networks, each network with a plurality of band splitter filters, and each subsequent network interconnected to a previous network via a filter to provide an equi-phase frequency response on the network's output. No new matter is entered by adding these claims. Support in the specification for these claims may be found on page 9, lines 13-28; page 11, lines 1-9 and 25-37; page 13, lines 14-20, and generally throughout the specification.

As discussed above, nothing in the prior art teaches the novel and non-obvious combination of band splitting, producing a substantially equi-phase response in the output bands and introducing distortion to each band prior to recombination.

Attorney Docket Number

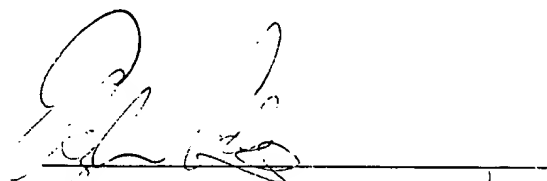
Applicant requests that the Attorney Docket Number be changed to 0805774-0004.

In light of the foregoing Amendment and Remarks, Applicant respectfully submits that the present case is in condition for allowance. A Notice to that effect is respectfully requested.

Please charge any fees associated with this filing, or apply any credits, to our Deposit Account No. 03-1721.

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MARKED-UP VERSION OF AMENDMENT TO SHOW CHANGES MADE

In the claims:

Please CANCEL claims 1, 4, 6, 8, 10-12, 14, 17 and 18;

ADD new claims 21-41; and

AMEND, the remaining claims as follows (additions are underlined, deletions are enclosed in brackets):

2. (Amended) A musical instrument preamplifier system comprising:

a filtering means for splitting an input signal into two or more separate frequency bands comprising a similar phase response for each frequency band;

two or more non-linear circuits, each of which distorts the input signal component of one of the frequency bands; and

a summing network for recombining said frequency bands;

[A musical instrument preamplifier system according to claim 1] wherein said filtering means comprises a cascade of $[2^{N-1}]2^N - 1$ pairs of even poled low and high pass filters arranged such that each pair splits the incoming frequency band in two, where N is the number of stages of pairs in the cascade, and wherein for the nth stage subsequent to the first, each low or high pass filter pair is preceded by $(2^{n-1} - 1)$ all pass filters with phase response corresponding to the $(2^{n-1} - 1)$ other low and high pass filter phase response in that stage such that the phase response of each stage is similar for each frequency band.

9. (Amended) A musical instrument preamplifier system comprising:

a filtering means for splitting an input signal into two or more separate frequency bands comprising a similar phase response for each frequency band;

two or more non-linear circuits, each of which distorts the input signal component of one of the frequency bands; and

a summing network for recombining said frequency bands;

wherein the filtering means further comprises variable cross-mixing after one or more stages of said filtering means; and

further comprising low pass filtering means after said non-linear circuits to reduce high frequency distortion products;

[A musical instrument preamplifier system according to claim 8] wherein said low pass filtering means is combined with said summing network such that in successive stages the lowest frequency band is low pass filtered with a low pass filter and the other frequency bands are all pass filtered with an all pass filter corresponding to said low pass filter, said lowest frequency band is then combined with the next lowest frequency band, and comprising subsequent stages of repeated filtering and combining until all frequency bands are combined, such that the phase response over all frequency bands through the low pass filtering and summing network is identical.

13. (Amended) A guitar preamplifier comprising:

a filtering means for splitting an input signal into a multiple number of separate frequency bands, comprising a cascade of $[2^{N-1}]2^N - 1$ pairs of even poled low and high pass filters arranged such that each pair splits the incoming frequency band in two, where N is the number of stages of pairs in the cascade, each low and high pass filter pair forming a state variable filter, and in each nth stage subsequent to the first, each low or high pass filter pair is preceded by $(2^{n-1} - 1)$ all pass filters having phase responses of the $(2^{n-1} - 1)$ low or high pass filter pairs in the other channels such that the phase response of each stage is similar for each frequency band, and said filtering means further comprising variable cross-mixing after one or more of said stages of filtering,

a multiple number of non-linear circuits, each arranged to distort the input signal component of one of the frequency bands; and

a summing network for recombining said frequency bands including low pass filtering means arranged such that in successive stages the lowest frequency band is low pass filtered with a low pass filter and the other frequency bands are all pass filtered with an all pass filter corresponding to said low pass filter, said lowest frequency band is then combined with the next lowest frequency band and subsequent stages of repeated filtering

and combining until all frequency bands are combined, such that the phase response over all frequency bands through the low pass filtering and summing network is identical.

15. (Amended) A digital musical instrument preamplifier system comprising:

a digital filtering means for splitting an input sampled signal into two or more separate frequency bands comprising a similar phase response for each frequency band;

two or more non-linear digital circuits, each of which distorts the input signal component of one of the frequency bands; and

a digital summing network for recombining said frequency bands;

[A digital musical instrument preamplifier according to claim 14] wherein said digital filtering means comprises a cascade of $[2^{N-1}]2^N - 1$ pairs of even poled low and high pass filters arranged such that each pair splits the incoming frequency band in two, where N is the number of stages of pairs in the cascade, and wherein for the nth stage subsequent to the first, each low or high pass digital filter pair is preceded by $(2^{n-1} - 1)$ all pass digital filters with phase response corresponding to the $(2^{n-1} - 1)$ other low and high pass digital filter phase response in that stage such that the phase response of each stage is similar for each frequency band.

19. (Amended) A digital musical instrument preamplifier system comprising:

a digital filtering means for splitting an input sampled signal into two or more separate frequency bands comprising a similar phase response for each frequency band;

two or more non-linear digital circuits, each of which distorts the input signal component of one of the frequency bands; and

a digital summing network for recombining said frequency bands;

wherein the digital filtering means further comprises variable digital cross-mixing after one or more stages of said digital filtering means; and

[A digital musical instrument preamplifier system according to claim 18] further comprising digital low pass filtering means after said digital non-linear circuits to reduce high frequency distortion products.

21. (New Claim) A musical instrument preamplifier system comprising:
- a filtering means for splitting an input signal into two or more separate frequency bands comprising a substantially equi-phase response for each frequency band;
 - two or more non-linear circuits, each of which distorts one of the frequency bands; and
 - a summing network for recombining said frequency bands.
22. (New Claim) A musical instrument preamplifier according to claim 21, wherein said filtering means comprises a cascade of $2^N - 1$ pairs of even-poled low and high pass filters arranged such that each pair splits the incoming frequency band in two, where N is the number of stages of pairs in the cascade, and wherein for the nth stage subsequent to the first, each low or high pass filter pair is preceded by $(2^{n-1} - 1)$ all pass filters with phase response corresponding to the $(2^{n-1} - 1)$ other low and high pass filter phase response in that stage such that the phase response of each stage is similar for each frequency band.
23. (New Claim) A musical instrument preamplifier system according to claim 22 wherein said cascade has two stages of two pole low and high pass filter pairs.
24. (New Claim) A musical instrument preamplifier system according to claim 21 wherein each low and high pass filter pair is a state variable filter.
25. (New Claim) A musical instrument preamplifier system according to claim 22 wherein each low and high pass filter pair is a state variable filter.
26. (New Claim) A musical instrument preamplifier system according to claim 21 wherein the filtering means further comprises variable cross-mixing after one or more stages of said filtering means.

27. (New Claim) A musical instrument preamplifier system according to claim 26 wherein the filtering means further comprises variable cross-mixing after one or more stages of said filtering means.
28. (New Claim) A musical instrument preamplifier system according to claim 26 further comprising low pass filtering means after said non-linear circuits to reduce high frequency distortion products.
29. (New Claim) A musical instrument preamplifier system according to claim 28 wherein said low pass filtering means is combined with said summing network such that in successive stages the lowest frequency band is low pass filtered with a low pass filter and the other frequency bands are all pass filtered with an all pass filter corresponding to said low pass filter, said lowest frequency band is then combined with the next lowest frequency band, and comprising subsequent stages of repeated filtering and combining until all frequency bands are combined, such that the phase response over all frequency bands through the low pass filtering and summing network is identical.
30. (New Claim) A musical instrument preamplifier system according to claim 21 wherein said non-linear circuit for each frequency band has a different gain than those in the other frequency bands.
31. (New Claim) A musical instrument preamplifier system according to claim 21 wherein said non-linear circuits for higher frequency bands have a higher minimum gain than the non-linear circuits for lower frequency bands.
32. (New Claim) A musical instrument preamplifier system according to claim 21 wherein the distortion by said non-linear circuits is variable.

33. (New Claim) A digital musical instrument preamplifier comprising:

a digital filtering means for splitting an input sampled signal into two or more separate output frequency bands comprising a substantially equi-phase response for each frequency band;

two or more non-linear digital circuits, each of which distorts one of the output frequency bands; and

a digital summing network for recombining said frequency bands.

34. (New Claim) A digital musical instrument preamplifier according to claim 33, wherein said digital filtering means comprises a cascade of $2^N - 1$ pairs of even poled low and high pass filters arranged such that each pair splits the incoming frequency band in two, where N is the number of stages of pairs in the cascade, and wherein for the n th stage subsequent to the first, each low or high pass digital filter pair is preceded by $(2^{n-1} - 1)$ all pass digital filters with phase response corresponding to the $(2^{n-1} - 1)$ other low and high pass digital filter phase response in that stage such that the phase response of each stage is similar for each frequency band.

35. (New Claim) A digital musical instrument preamplifier according to claim 34 wherein each digital low-pass and high-pass filter is obtained by a bilinear transformation of a corresponding low-pass and high-pass analogue filter, and the all-pass filters are obtained by a bilinear transformation of a corresponding all-pass analogue filter.

36. (New Claim) A digital musical instrument preamplifier according to claim 33 wherein said digital filtering means comprises linear phase finite impulse response filters.

37. (New Claim) A digital musical instrument preamplifier according to claim 33 wherein said digital filtering means further comprises variable digital cross-mixing after one or more stages of said digital filtering means.

38. (New Claim) A digital musical instrument preamplifier according to claim 37 further comprising digital low pass filtering means after said digital non-linear circuits to reduce high frequency distortion products.

39. (New Claim) A digital musical instrument preamplifier according to claim 38 wherein said digital low pass filtering means is combined with said summing network such that in successive stages the lowest frequency band is low pass filtered with a digital low pass filter and the other frequency bands are all-pass filtered with a digital all-pass filter corresponding to said digital low-pass filter, said lowest frequency band is then combined with the next lowest frequency band, and comprising subsequent stages of repeated digital filtering and combining until all frequency bands are combined, such that the phase response over all frequency bands through the digital low pass filtering and summing network is identical.

40. (New Claim) A musical instrument preamplifier comprising:

- a) a filtering means with a first filter network, the network including:
 - an input,
 - a plurality of outputs, and
 - a plurality of band splitter filters to split a signal on the input into a plurality of substantially equi-phase frequency bands for the outputs;
- and
- b) a plurality of non-linear circuits coupled to a plurality of the outputs to distort respective output frequency bands.

41. (New Claim) A musical instrument preamplifier system comprising:

- a filtering means for splitting an input signal into plurality of substantially equi-phase frequency band outputs, and
- a plurality of non-linear circuits coupled to filter means to distort respective output frequency bands,
- wherein the filtering means includes a cascade of a first filter network, and one or more subsequent filter networks, each network including:

an input,
a plurality of outputs, and
a plurality of band splitter filters to split a signal on the input into a plurality of frequency bands for the outputs,
wherein for one or more of the subsequent networks, the input of each is coupled to one output of another network via a filter to provide substantially equi-phase frequency bands on the network's outputs,
and wherein outputs of some of the networks form frequency band outputs of the filter means.